



# PATENT SPECIFICATION

DRAWINGS ATTACHED

884,720

Date of Application and filing Complete Specification March 4, 1960.

No. 7856/60.

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Index at acceptance:—Classes 40(4), K2; 27, A1J3; and 37, A18(AX:B1B2), A19(H:L2:X).  
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## COMPLETE SPECIFICATION

### Coin-controlled Apparatus

SPECIFICATION NO. 884,720

By a direction given under Section 17 (1) of the Patents Act 1949 this application proceeded in the name of Telefon Fabrik Automatic A/S, of 7, Annalæge, Copenhagen, Denmark, a Danish Company.

THE PATENT OFFICE

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amount or coin, the value of which corresponds to the charge to be paid for the desired call.

20 In telephone plants in which calls are established under the condition referred to above, it is well known to place a so-called coin-signalling device at the telephone apparatus in question, which signalling device by the insertion of a coin in the coin chute of the  
25 telephone apparatus transmits an electrical pulse to a control place, e.g. to an assistant in the telephone exchange in question, to which place the said pulses are transferred as audio-frequency or optical signals and in the  
30 case of an automatic telephone plant are caused to influence a device for an automatic control of the charge to be paid for the desired call and of the value of the inserted coins.

35 Since coin-controlled telephone apparatus is normally located at locations where said apparatus is subject to shakings and to the influence of humidity it is of considerable interest to simplify the equipment of such telephone apparatus inclusive of the coin-  
40 signalling transmitter as much as possible. It is known to use a coin-signalling transmitter consisting solely of an arm, being by the insertion of a coin depressed to operate an electric contact device, by way of which a  
45 pulse is then transmitted to the telephone line

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the present invention relates to a coin-

control device in which an inserted coin operates to cause the transmission of a characteristic signal without influencing any contact member or any other adjustably mounted member, viz. 60  
65 simply by its own motion through an electric or magnetic field. The coin in question may consist of a metallic or—if desired—of a non-metallic member.

According to the invention there is provided a coin-controlled apparatus consisting in a coin chute, energizing means on one side of the chute to cause electric or magnetic fields to traverse the chute at two zones, a detector at each zone on the other side of the chute  
75 and opposite to the energizing means, a circuit in which the detectors are arranged so in the circuit and with a coin crossing a zone, current flows in the circuit, and means res-  
80 ponsive to the current in the circuit to initiate a signal.

The provision of telephone apparatus with coin control devices would ordinary demand that two or even more coils of different values and consequently different sizes should be applicable for the purpose aimed at, and for this reason the size of a coin to be inserted in the coin chute would have to be indicated in the circuit referred to above by a variable 90

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### COMPLETE SPECIFICATION

#### Coin-controlled Apparatus

I, LEONARD JOSEPH FISHER, a South African citizen, of 1210, Management House, Steiermans and Meile Street, Braamfontein, Johannesburg, Union of South Africa, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:

The present invention relates to a coin-control apparatus to be used in combination with a telephone apparatus, the employment of which implies a payment of a charge prior to the establishment of the desired call by the insertion in a coin chute of a coin or a number of coins, the value of which corresponds to the charge to be paid for the desired call.

In telephone plants in which calls are established under the condition referred to above, it is well known to place a so-called coin-signalling device at the telephone apparatus in question, which signalling device by the insertion of a coin in the coin chute of the telephone apparatus transmits an electrical pulse to a control place, e.g. to an assistant in the telephone exchange in question, to which place the said pulses are transferred as audio-frequency or optical signals and in the case of an automatic telephone plant are caused to influence a device for an automatic control of the charge to be paid for the desired call and of the value of the inserted coins.

Since coin-controlled telephone apparatus is normally located at locations where said apparatus is subject to shakings and to the influence of humidity it is of considerable interest to simplify the equipment of such telephone apparatus inclusive of the coin-signalling transmitter as much as possible. It is known to use a coin-signalling transmitter consisting solely of an arm, being by the insertion of a coin depressed to operate an electric contact device, by way of which a pulse is then transmitted to the telephone line

in question, the value of the inserted coin being signified e.g. by the transmission of a smaller or larger number of earth-connection pulses, according as the value of the inserted coin is lower or higher, which pulses are registered in the exchange station. It has however been observed that even such a simple coin-signalling device may fail, e.g. because the resistance to the movement of said arm has to be adjusted according to the weight of the coin, which weight may be variable and furthermore and especially because the electric contacts being controlled by the coins may readily be burned or strangled and, if so, fail to operate as desired.

The present invention relates to a coin-control device in which an inserted coin operates to cause the transmission of a characteristic signal without influencing any contact member or any other adjustably mounted member, viz. simply by its own motion through an electric or magnetic field. The coin in question may consist of a metallic or—if desired—of a non-metallic member.

According to the invention there is provided a coin-controlled apparatus consisting in a coin chute, energizing means on one side of the chute to cause electric or magnetic fields to traverse the chute at two zones, a detector at each zone on the other side of the chute and opposite to the energizing means, a circuit in which the detectors are arranged so that with no coin in the chute no current flows in the circuit and with a coin crossing a zone, current flows in the circuit, and means responsive to the current in the circuit to initiate a signal.

The provision of telephone apparatus with coin control devices would ordinarily demand that two or even more coils of different values and consequently different sizes should be applicable for the purpose aimed at, and for this reason the size of a coin to be inserted in the coin chute would have to be indicated in the circuit referred to above by a variable

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number of pulses dependent on the size of the coin, which pulses are transferred to the telephone exchange or to any other station or location for the control of the charges and the values of the coins in question.

With a view to the possibility of using coins of different sizes a coin-control apparatus would ordinarily be fixed at one side wall of the chute with a plurality, say two or more members mutually displaced along the coin chute for the production of magnetic or electric fields across the coin chute and with a corresponding number of control members being sensitive to variations of said fields and shown at the opposite side wall of said chute. The said control members are according to the invention electrically or magnetically connected up in one and the same electric control circuit in such a manner that the influences of all of said control members upon the said circuit ordinarily—which means if no coin is located in the coin chute in a position facing any of said control members—would compensate each other. The insertion of a coin in the chute would destroy this balance each time said coin passes one of said control members because then the intensity of the field between the control member in question and the oppositely located member for producing said field would be varied and cause the induction of an electric pulse upon said circuit. The number of said electric pulses serves the purpose of identifying the value of the inserted coin.

The coin chute is in a known manner provided with individual coin insertion openings for the coins of different sizes and said openings are located in such positions on the chute that a coin of a value being higher than the value of another applicable coin would in the course of its movement through the coin chute have to pass a larger number of control members than the last mentioned coin and would consequently cause the transmission of a larger number of pulses than the last mentioned coin would if inserted.

The members referred to above for the production of a magnetic or electric field may preferably be fed with alternating current and may e.g. be solenoids or condenser-electrodes and the control members located oppositely to said field producing members and being sensitive to field variations may consist of solenoids or condenser electrodes respectively and are so connected up in series or in parallel in the electric control circuit referred to above, which circuit additionally contains a pulse transmitter. The resulting influence of all of the fields passing said control members would not operate said pulse transmitter as long as no coin passes the chute, but would cause the said pulse transmitter to operate each time a coin passes anyone of said control members, because as referred to above the field influencing the control member in question

would then be varied and the balance between the influences of all of the control members upon the said circuit then be eliminated.

In a coin control apparatus embodying the invention it would be possible to produce the pulses for the signalling of the value of an inserted coin and to transmit said pulses through a telephone line to a centrally disposed place for the registering of the value of the coins and the charges for the desired call without the application of separate current sources for the production of the fields in question, since by the use of transistor couplings in the current circuits of the said field-producing members and of the said field-sensitive control members it would be possible to utilize the microphone voltage of the telephone apparatus in question for the operation of the automatic coin-control device by means of a very weak current. To this end in a coin-control device embodying the present invention having two or more members for producing magnetic or electric fields across the coin chute the said members may be connected up in series or in parallel in the input circuit of a transistor amplifier which is supplied with current from the coin-controlled telephone apparatus in question and said amplifier may, if desired, be means of a feed-back coupling be arranged to operate as an oscillator for the supply of current or voltage to said members. In a current supply system of this kind the oscillator may be connected in parallel with the microphone of the telephone apparatus, so that the oscillator is supplied with current when the microphone circuit is closed.

The control members being sensitive to field variations in a transistor coupling of the kind referred to may be inserted in the base-emitter circuit of a further transistor by way of a resistance and the collector-emitter circuit of said further transistor may have one of its terminals connected to earth through a resistance in the base-emitter circuit of a third transistor, and its other terminal connected to one of the line branches of the coin-controlled telephone apparatus in question to which line branch the collector electrode of the said transistor also is connected, preferably by way of a resistance which ensures that a certain voltage difference would appear across the collector-emitter circuit of said further transistor. By the appearance of a non-balance between the influences of the field producing members upon the first mentioned transistor, operating as an oscillator, an amplified unidirectional current would pass the transistor to which the control members being sensitive to field variations are connected, and a portion of this current would pass the base-emitter portion of the said third transistor and cause said transistor to be conductive, and then the line branch of the telephone to which this last mentioned transistor

is coupled may be considered to be connected to earth in the moment the balance of the influences of the fields of the control member upon the control circuit is disturbed and as long as said disturbance is maintained. Thereby an impulse would appear through the line branch in question on to the coin-and charge controlling device.

Instead of earth-connection-pulses audio-frequency signals may be used for the purpose aimed at in which case the line mentioned transfer over which the earth connection was established in the embodiment described above is to be coupled so as to operate as an oscillator with an oscillation of a proper unlike frequency.

In the accompanying drawings:—  
Figure 1 is schematically a telephone line between a coin-controlled telephone apparatus and a telephone exchange;

Figure 2 is an electrical circuit arrangement for a coin-signalling device according to the invention in which the signals indicating the coin are produced by means of magnetic fields.

Figure 3 is a schematic view of a coin-chute provided with a number of magnetic cores facing the said chute and producing magnetic fields to the coin-controller; and

Figure 4 is a circuit diagram for a transistor amplifier for the production of coin-signalling pulses to be transmitted to a coin-and charge control location, not shown.

In Figure 1, *a* is a telephone apparatus having a device *b* for producing coin signals which device is conductively connected to a coin-and charge control location *c* in a remote telephone exchange *d* by way of a line *l*.

The present invention relates to the performance of a device *b* for the production of coin signals, and Figure 2 shows schematically an embodiment of such a signalling device, comprising four electro-magnets 1, 2, 3, 4, all of which are supplied with alternating current from a generator 5 and are arranged to face one side wall 6 of a coin chute 6, 7. Facing the opposite side wall 7 of said chute a number of cores 8, 9, 10 and 11 of magnetic materials are arranged oppositely to the electro-magnets 1, 2, 3 and 4. Each of said magnets 8—11 is provided with a winding 12. The number of the magnets 1—4 and the cores 8—11 may also be any desired one, i.e. other than four.

In the embodiment shown the coin chute 6, 7, Figure 2, is as shown in Figure 3 provided with two apertures 13 and 14 for the insertion of coins of different sizes, e.g. 10-cent piece and a 5-cent piece respectively.

The three magnets 1, 2 and 3 are arranged in mutually staggered positions along the portion of the chute located between the two apertures 13 and 14 for which reason a coin being inserted in the chute through the aper-

ture 14 when moving through the chute 6, 7 in the direction of arrows in Figures 3 would have to pass only one of the magnets 1—4, viz. the magnet 4 and consequently would cause the production of a single field variation whereas a coin being inserted through the aperture 13 would have to pass all of the four magnets 1—4 on its way through the chute 6, 7 and consequently would cause a variation of a field of the device four times on its way through the chute and thus cause the production of four pulses in the circuit of the windings 12 of the magnets 8—11 as more especially referred to below with reference to Figure 2.

The four coils 12 are alternately wound in opposite direction each around one of the cores 8—11, for the sake of simplicity it is assumed that all of said coils are provided with exactly the same number of turns and that this holds good also as far as the coils on the magnets 1—4 are concerned. The coils of the magnets 1—4 are so interconnected that the alternating fields produced by these coils at any movement are directed in one and the same direction, whilst the windings 12 of the magnets 8—11 are interconnected in such a manner that the voltages of equal values which the fields from the magnets 1—4 would induce into the windings 12 are in pairs oppositely directed. If so, no current would appear in the pulse circuit 16 when no coin is present in the coin chute 6, 7 oppositely to any one of the magnets 1—4. In the moment a coin inserted in the coin chute passes any one of the magnets 1—4 the intensity of the magnetic field in the corresponding one of the cores 8—11 facing said magnet in question would undergo a variation, causing a disturbance of the balance between the voltages or potentials which are induced in the circuit 16 by means of the fields passing the four coils 12 and consequently a current would appear in the circuit 16 and operate the pulse producing device 15 so as to cause this device to transmit a pulse to the telephone line *l* or more exactly to one of the branches of said line on to a coin- or charge control location, not shown in Figure 2.

Obviously, instead of using electro-magnets for the production of magnetic control fields condenser electrodes may be used for producing electric fields between such electrodes and other condenser electrodes located oppositely to the first mentioned condenser electrodes relatively to the coin chute and connected up in a common circuit jointly with said first mentioned condenser electrodes in such a manner that the electric fields between said condenser electrodes mutually compensate the influences of each other upon the circuit 16 when no coin is situated in the coin chute oppositely any of the said electrodes.

Figure 4 is a diagram of a coin signalling device according to the invention in which

transistors are used for the amplification of the produced control pulses. In this diagram the field producing members, e.g., magnets or solenoids  $B_1, B_2, B_3$ , and  $B_4$  are mutually connected in series in the collector-base circuit of a transistor  $T_1$  in series with a resistor  $R_1$ . In the embodiment shown a number of feedback coils  $G_1, G_2, G_3$  are inserted in the said circuit which feedback coils cause the transistor  $T_1$  to operate as an oscillator.  $C_1$  is a tuning condenser and  $C_2$  is a by-pass condenser for the base resistor  $R_2$ . The transistor  $T_2$  is provided with current from the telephone apparatus  $a$  in question through a resistance  $R_3$ , the oscillator being connected in parallel with the microphone of the telephone apparatus  $a$  and would consequently receive current when the micro-telephone is elevated from the telephone apparatus. The frequency of oscillation of the oscillator may suitably be so chosen as to be higher than the audible frequencies.

The four control members  $m_1, m_2, m_3$ , being sensitive to the magnetic fields produced are connected to the base electrode of a second transistor  $T_3$  in series with a resistance  $R_4$ , and are further inserted in the base-emitter circuit of the last mentioned transistor as shown in Figure 4. The emitter electrode of this transistor is by way of a resistance  $R_5$  which is also inserted in the base-emitter circuit of a third transistor  $T_4$  and is connected to earth jointly with the emitter electrode of the last mentioned transistor.

Ordinarily no current of importance would pass the transistor  $T_3$  because the base electrode of this transistor has the same potential as the emitter electrode as long as the influences of the four coils  $m_1, m_2, m_3$  upon the base-emitter circuit of this transistor compensate each other. Furthermore, no current would pass the transistor  $T_4$ , the base-electrode of which is connected to the emitter electrode of the transistor  $T_3$ .

The collector electrode of the transistor  $T_4$  is by way of a resistance  $R_6$  connected to one of the conductors  $L_1$  of a telephone line  $L$ ,  $L_2$  for the telephone apparatus  $a$  in question, and said conductor is furthermore connected to the emitter electrode of the transistor  $T_1$  and the collector electrode of the transistor  $T_2$ . Across the last mentioned transistor a potential would appear if the balance between the influences of the coils  $m_1, m_2, m_3$  upon the base-emitter circuit of this transistor were disturbed, viz., when a coin passes the coin chute. The said potential would cause a unidirectional current to pass the resistance  $R_6$  and this current is amplified by the transistor  $T_4$  and passes partly through the resistance  $R_6$  to earth partly through the base-emitter path of the transistor  $T_3$  to earth.

The said current is smoothed by a condenser  $C_3$  and will adopt such a value that the line  $L_2$  may be considered to be connected to earth across the transistor  $T_4$  when such a current appears. This causes a current pulse in the conductor  $L_2$  of the telephone line, which pulse is conducted to the control location  $c$ , Figure 1, for the inserted coin in question.

$R_7$  is a small resistance adapted to ensure that a certain loss of voltage would appear across the transistor  $T_3$  when the current appears in the collector emitter circuit of the transistor  $T_4$ .

If it is desired to use audible signals instead of earth connection pulses for the indication of the value of the inserted coin, pieces the transistor  $T_3$  may be coupled so as to operate as an oscillator with a proper audible frequency. This transistor would only oscillate when the base electrode of same is subjected to a proper bias, viz., when a coin passes the coin chute.

The magnets 1—4, Figure 2, may, if desired, be permanent magnets.

#### WHAT I CLAIM IS:—

1. A coin-controlled apparatus consisting in a coin chute, energizing means on one side of the chute to cause electric or magnetic fields to traverse the chute at two zones, a detector at each zone on the other side of the chute and opposite to the energizing means, a circuit in which the detectors are arranged so that with no coin in the chute no current flows in the circuit and with a coin crossing a zone, current flows in the circuit, and means responsive to the current in the circuit to initiate a signal.

2. The apparatus as claimed in Claim 1 in which each field is caused by an electromagnet.

3. The apparatus as claimed in Claim 1 in which each field is caused by a condenser straddling the chute, one plate of each condenser causing a field and the other plate of each condenser being a detector.

4. The apparatus as claimed in Claim 2 in which the detectors are coils, the coils being connected in such a manner that voltages induced into them by the field oppose each other.

5. The apparatus as claimed in any of the above claims in which the detectors form the input to an amplifying device.

6. The apparatus as claimed in Claim 5 in which the amplifying device employs transistors.

7. The apparatus as claimed in either of Claims 5 or 6 in which the amplifying device also functions as an oscillator.

8. A coin-controlled apparatus substantially as herein described with reference to Figures 1, 2, 3 and 4 of the accompanying drawings.

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